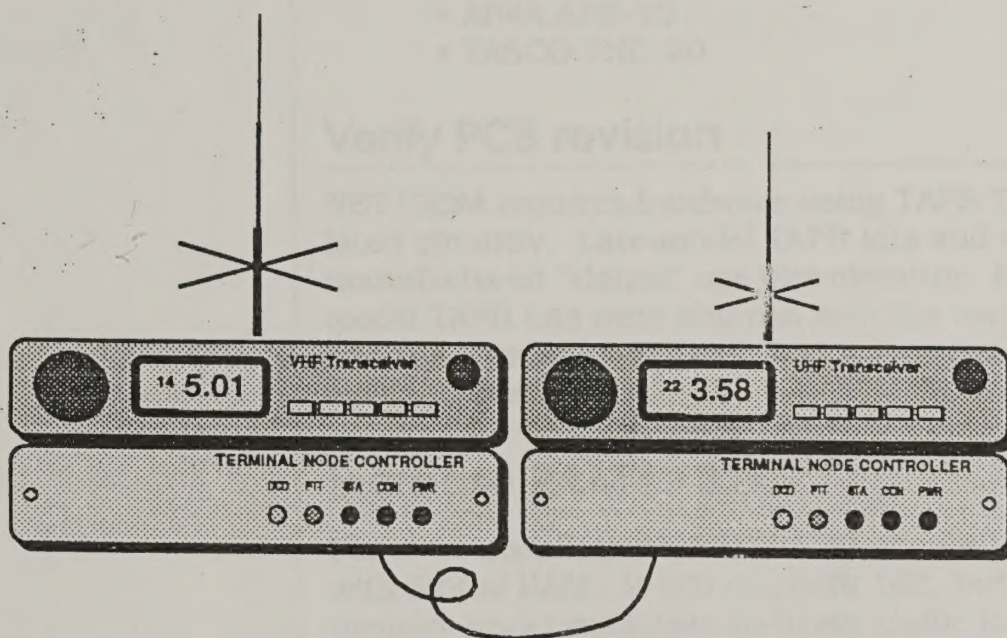

NET/ROM

Version 1.3 Documentation
September, 1987

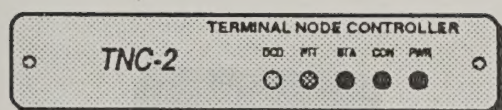


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Installation

This chapter provides a step-by-step checklist for installing a new NET/ROM node. For a hassle-free installation, be sure to follow the instructions carefully.

TNC-2 Hardware Setup



The following instructions apply to the TAPR TNC-2 terminal node controller or any of the commercially-available TNC-2 "clones" including:

- AEA PK-80
- GLB TNC2A
- MFJ 1270 and 1274
- Pac-Comm TNC-200
- California Digital TNC-2
- Fujl Digital Systems DA-12F and DA-12M
- AIWA APX-25
- TASC0 TNC-20

Verify PCB revision

NET/ROM requires hardware using TAPR TNC-2 revision 2 (or later) circuitry. Late-model TAPR kits and all commercially manufactured "clones" use this circuitry. However, a few early-model TAPR kits were shipped with the version 1 circuit board, and these must be upgraded with the version 2 modifications available from TAPR.

Increase RAM to 32K

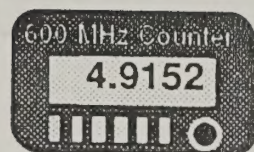
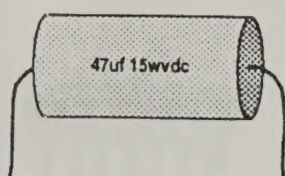
For most installations, NET/ROM should be installed in a TNC with 32K of RAM. It will run with 16K, but will run short of memory under moderate-to-heavy traffic loads.

Most TNC-2s manufactured prior to 1987 were equipped with only 16K of RAM. Inasmuch as the latest version of TAPR firmware requires 32K, however, many TNC-2s have already been upgraded to 32K.

To upgrade a 16K TNC-2 to 32K:

1. Remove U24 and U25 (both are 8K RAMs, type 6264).
2. On the bottom of the circuit board, cut the trace between the center and top positions of JMP12.
3. Add a wire connecting the center and bottom positions of JMP12.
4. Install one 32K RAM IC (type 43256 or 62256) in U25.





Modify push-to-talk failsafe timer

All tested TNC-2s have a push-to-talk failsafe timer which limits key-down time to approximately 10-12 seconds maximum. This value is too short for NET/ROM use at 1200 baud, and can cause truncation of crosslink transmissions and routing broadcasts. We recommend increasing the failsafe timeout interval to approximately 60 seconds. To do this, simply replace capacitor C31 with a 47 microfarad radial-lead electrolytic capacitor rated at 15 WVDC or higher. Be sure to observe proper polarity.

Set CPU clock speed to 4.9 MHz

TNC-2's are normally set up for slow CPU clock speed (2.4576 MHz). Although NET/ROM will run reliably at this speed, performance is noticeably improved by changing to high CPU clock speed (4.9152 MHz). Although this is somewhat faster than the rated speed of some TNC-2 parts, we have tested NET/ROM with numerous TNC-2s (including clones from several manufacturers), and none failed to operate reliably at the higher clock speed.

To change a TNC-2 to high clock speed:

1. On the bottom of the circuit board, cut the trace connecting the center and right positions of JMP2.
2. Add a wire connecting the center and left positions of JMP2.

NOTE: For the MFJ 1270B, the jumpering is different. This may also be true for other TNC-2 "not-quite-clones" so check your TNC documentation carefully.

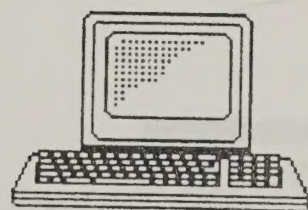
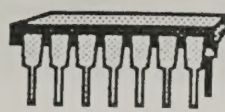
Wire DCD-B to RS232 pin 23

The following modification is required for TNCs that will be used in dual- or multi-channel NET/ROM configurations. Since it does not impair normal operation in any way, we recommend it for all TNCs to be used with NET/ROM...you may want to upgrade to dual-channel operation later.

To make this modification, connect one end of a wire to pin 23 of the RS232 connector. Connect the other end of the wire to pins 1-2-3 of JMP9 (these three pins are already hooked together on the circuit board).

This modification allows the NET/ROM firmware to be configured for multi-channel operation by jumpering RS232 pins 10 and 23 together in the TNC-to-TNC cable.

Bob
3987



20 20
1455
100
900
Bob + MFI

Replace U3 op-amp

Most TNC-2s use an LM324 op-amp (U3) to generate bipolar RS232 output signals. However, LM324s do not have sufficient slew rate for reliable operation at 9600 baud. This can be remedied easily by replacing U3 with a faster op-amp. The modification is especially important for dual- or multi-channel nodes where 9600-baud operation is essential.

Simply replace the LM324 at U3 with either a TL074 or TL084 IC (manufactured by Texas Instruments and perhaps others).

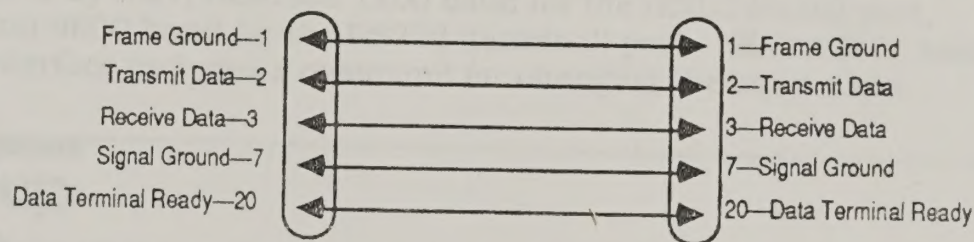
Set baud-rate switches

Follow the switch-setting instructions in the TNC-2 manual. We have performed extensive reliability testing of NET/ROM at HDLC and RS232 baud rates up to 9600; it runs reliably at these high baud rates even at slow CPU clock speed, although we strongly advise using 4.9 MHz CPU clock for reasons of efficiency.

For dual- or multi-channel operation, we strongly suggest setting the RS232 speed at 9600 baud—it makes a big difference in cross-channel performance! Be sure to upgrade the U3 op-amp, however.

Connect host terminal

To connect a host terminal to the TNC-2, almost any standard RS232 cable will do (as long as pins 9, 10, and 23 are not used). If you are wiring a special cable for this purpose, wire it as follows:



It is also OK to leave DTR (pin 20) unconnected. Be certain to leave pins 9, 10, and 23 unconnected (at the TNC end, at least).

Make sure your TNC still works...

Connect a terminal to the TNC, power it up, and make sure that you get a sign-on message and that the unit still appears healthy. If it doesn't, then (1) you have made an error; (2) you have installed a bad IC; or (3) your TNC won't run at the fast CPU clock speed (quite unlikely).



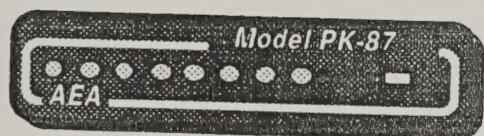
Finally, install NET/ROM

NET/ROM is distributed in the form of a 27C256 EPROM which simply plugs into the ROM socket (U23) of the TNC-2 in place of the standard TAPR firmware ROM. Be very careful when inserting the new EPROM, making sure that pin 1 is oriented correctly, and that none of the pins are bent under the IC.

For the amateur radio version NET/ROM, the node's amateur callsign is "hard-coded" into each NET/ROM EPROM, and cannot be changed. If you must change the node's callsign, you will have to order a new EPROM.

NOTE: Be certain to save the original ROM—you may need it if you ever want to recalibrate the TNC modem or to restore regular TNC functionality.

PK-87/PK-90 Hardware Setup

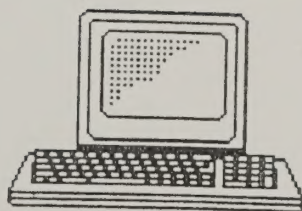


Modify the PK-87 or PK-90 in accordance with the applicable AEA service bulletin. As indicated in the service bulletin, AEA offers both a parts kit and a factory modification service.

For dual-channel installations, on each end of the TNC-to-TNC interconnect cable, add a jumper from pin 4 to pin 6 (in addition to the jumper from pin 10 to pin 23). Multi-channel installations of three or more interconnected PK-87s or PK-90s are not recommended, since the diode coupler illustrated in the NET/ROM manual will not work with the PK-87/PK-90.

The PK-87/PK-90 baud rates are set by software (rather than by the DIP switches used by the TNC-2). The default baud rates used by NET/ROM are 1200 baud for the HDLC (radio) port, and 9600 baud for the RS232 (terminal) port. NET/ROM's host interface includes a command for changing the baud rates.

Software Setup



After setting up the TNC hardware, connect a terminal to the RS232 port. Power up the TNC and make sure you see the NET/ROM sign-on message. Then perform the following steps:

Set or verify the node's callsign

For the amateur radio version of NET/ROM, the hard-coded callsign of the node is displayed in the NET/ROM sign-on message. Make sure it is correct!

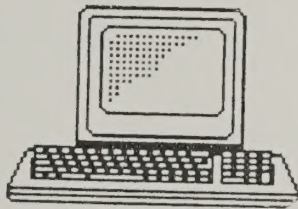
For the commercial version of NET/ROM, set the callsign using the ESC-I command described in the "Host Interface" chapter. The node will not transmit unless the callsign has been set.

Connect to the node

Enter ESC-C followed by a carriage-return. This connects the host terminal to the node's command interpreter. The node should respond with a "CONNECTED to..." message.

Set the node's identifier

Use the IDENT command to enter the mnemonic identifier of the node, which can be up to six characters long. Don't use punctuation or non-printing control characters in the identifier, and don't use an identifier that "looks like" a valid amateur call sign. (Suggestion: three-letter airport identifiers make nice node mnemonics.)



Set the password string

Enter ESC-P followed by a "password string" up to 80 characters long. It is best to pick a string that occupies the full 80 characters, or close to it, and doesn't contain too many spaces. The string may contain any ASCII characters except CR and LF...even non-printing control characters are legal. You must remember the password string in order to perform privileged control operator functions remotely. Don't forget it unless you enjoy trips to the site!

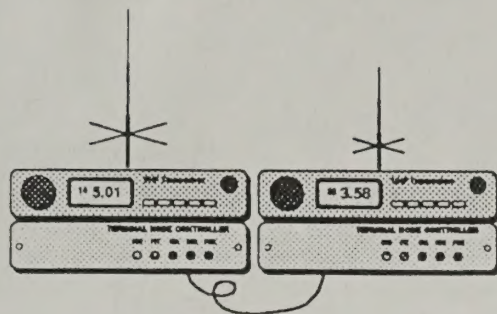
Prepare for unattended operation

Enter ESC-D to make sure the host interface is disconnected. Enter ESC-Y-O to disable host connections. You should always remember to do these two things before you disconnect the host terminal. ✓ ☐

NOTE: The software setup described above assumes that you are using the standard configuration of NET/ROM that supports a terminal interface. For Host NET/ROM, the setup procedure is analogous, but a computer and suitable host software is required to access the node's host interface.

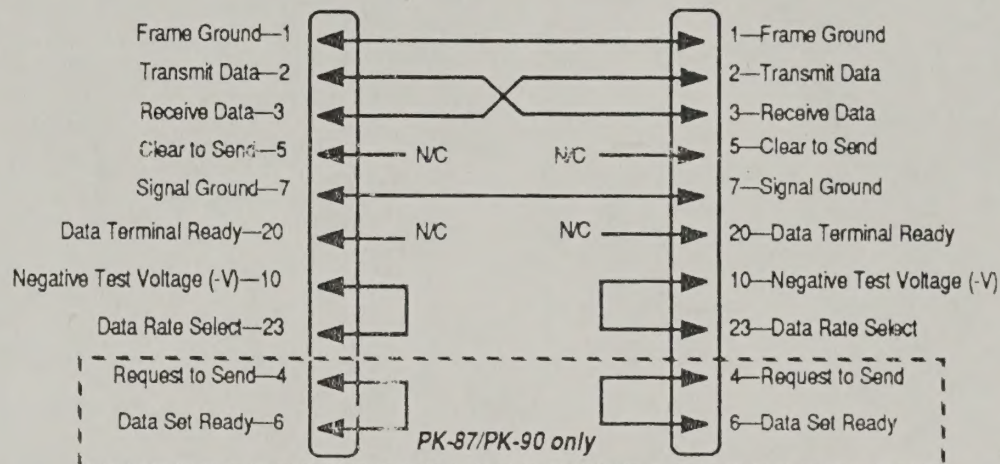
ESC P PASSWORD RETURN

Dual- or Multi-Channel Installations

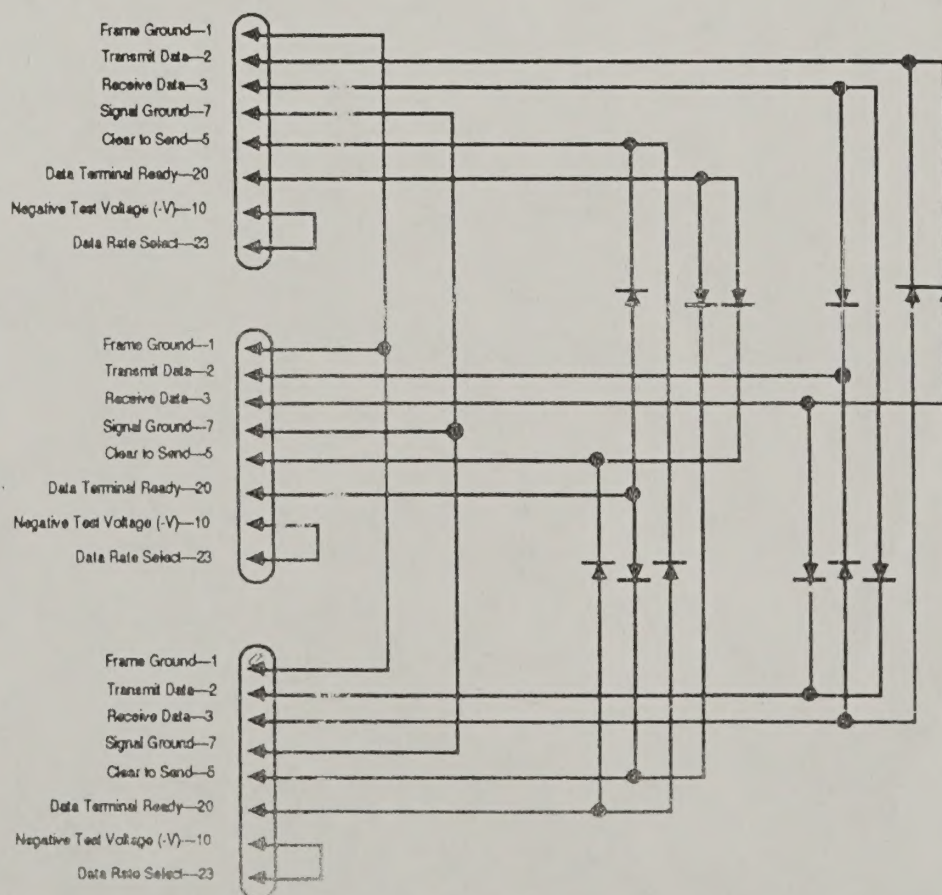


To install a dual- or multi-channel NET/ROM node, you should follow the previously-described steps for each TNC. Make certain that each TNC has a different callsign (often, only the SSID suffix changes). Verify that each TNC is functioning correctly as a single-channel node before attempting to interconnect the TNCs.

For a dual-channel node, simply connect the two TNCs together, using a special RS232 cable wired as shown in the diagram. (Don't try to use the terminal cable— it won't work!)



To interconnect three or more TNCs as a multi-channel node, you will have to make up a diode-matrix coupler. A schematic for a three-channel coupler is shown below. It uses 12 diodes (1N4148 or equivalent). A four-port coupler is similar, but requires 24 diodes, and is probably the maximum practical configuration.



Dual- or Multi-Channel Installations

To install a dual- or multi-channel NETVIM node, you should follow the previously-described steps for each TNC. Make certain that each TNC has a different address (often the last 8 bits of the address). Verify that each TNC is functioning correctly as a single-channel node before attempting to interconnect the TNCs.

For a dual-channel node, simply connect the two TNCs to a single serial RS-232C cable with an adapter in the diagram. (Don't try to use the terminal cable—it won't work.)



To interconnect three or more TNCs as a multi-channel node, you will have to make up a custom cable connector. A connector for a three-channel node is shown below. It uses 12 conductors (4 for each TNC). A four-port connector is similar, but requires 16 conductors, and is probably the maximum practical connector.

